New insights in dynamic structuring of natural rubber thanks to AsFFFF-MALS

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Natural rubber (NR) from Hevea brasiliensis has a complex associative structure generating aggregates (micro and macro) between poly(cis-1,4-isoprene) chains. The macroaggregates, called macrogel (or gel phase), are insoluble in good solvents for polyisoprene. The soluble part contains the poly(cis-1,4-isoprene) chains and microaggregates. The associative structure of NR changes over time (storage). During this dynamic of structuring the macroaggregates quantity increases and the macromolecular structure of NR evolves We present a study by asymmetrical field flow field fractionation coupled to a multiangular light scattering detector (AsFFFF-MALS) undertaken to gain a clearer understanding of the dynamic of structuring of NR. The accelerated structuring, or fast structuring, of NR samples was done on phosphorus pentoxide (P_2O_5) during 24 hours at 60°C. After fast structuring, the macroaggregates quantity increased significantly, the density of microaggregates and the quantity of short and medium poly(cis-1,4-isoprene) chains decreased. Mechanisms of reactivity between the different entities (poly(cis-1,4-isoprene) chains and microaggregates) were proposed to explain the observed results.